NAVAL WAR COLLEGE
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"REEVALUATING DOCTRINE FOR JOINT THEATER AIR AND MISSILE DEFENSE"

Three proposals for changing Joint Doctrine in light of the evolving air and missile threats and the fielding of new U.S. active defense systems.

By

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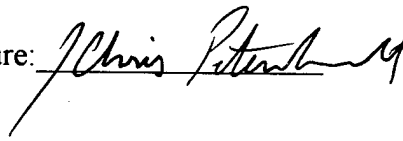
A paper submitted to the Faculty of the U.S. Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal view and are not necessarily endorsed by the Naval War College, the Department of the Navy, or the interviewed organizations.

Signature: 

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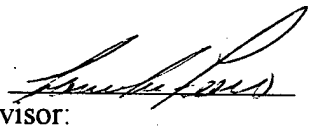

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The Joint Theater Air and Missile Defense (JTAMD) threat is evolving rapidly. Such threats include not only Theater Ballistic Missiles, but also cruise missiles and eventually stealth attack aircraft. The US is developing new active defense systems to help meet the challenges of these threats. However, the joint doctrine, which is necessary to integrate these forces, is not keeping pace. Specifically, the doctrine must change in order to take advantage of the overlapping sensor and engagement envelopes that will become more common once these advanced defenses are fielded.

This paper explores three proposals that will enable a JFC to better optimize and integrate a JTAMD network of sensors and weapons. First, the JFC should have the option of making the Area Air Defense Commander (AADC) a coequal with the Joint Force Air Component Commander. This option would improve interservice coordination and allocation of active defense units, especially during the deployment and lodgment phase of a campaign. Second, the Joint Information Control Officer (JICO) must be defined and empowered in order to overcome interservice interoperability problems and establish a theater-wide JTAMD picture. Third, in order to deconflict multiple engagements and maintain overlapping sensor coverage as the battle unfolds, the AADC may have to conduct both centralized planning and centralized execution.

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Abbreviations

AADC	Area Air Defense Commander
ASCIET	All Service Combat Identification Evaluation Team
ASCM	Anti-Ship Cruise Missile
DAL	Defended Asset List
ECOA	Enemy Courses of Action
GPS	Global Positioning System
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
JICO	Joint Information Control Officer
JTAMD	Joint Theater Air and Missile Defense
LACM	Land Attack Cruise Missile
OCA	Own Courses of Action
OPCON	Operational Control
ROE	Rules of Engagement
TACON	Tactical Control
TADC	Theater Air Defense Commander
TBM	Theater Ballistic Missile
TBMD	Theater Ballistic Missile Defense
TEL	Transportable-Erector-Launcher
TMDA	Theater Missile Defense Advisor
USACOM	United States Atlantic Command
USCENTCOM	United States Central Command
USEUCOM	United States European Command
WMD	Weapons of Mass Destruction

Glossary

Area Air Defense Commander (AADC). Within a unified command, subordinate unified command, or joint task force, the commander will assign overall responsibility for air defense to a single commander. Normally, this will be the component commander with the preponderance of air defense capability and the command, control, and communications capability to plan and execute integrated air defense operations. Representation from the other components involved will be provided, as appropriate, to the AADC's headquarters. (Joint Pub 1-02)

Joint Force Air Component Commander (JFACC). The JFACC derives authority from the JFC who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The JFC will normally designate a JFACC. The JFACC's responsibilities will be assigned by the JFC (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision). Using the JFC's guidance and authority, and in coordination with other Service component commanders and other assigned or supporting commanders, the JFACC will recommend to the JFC apportionment of air sorties to various missions or geographic areas. (Joint Pub 1-02)

Joint Information Control Officer (JICO). Manage the Multi-Tactical Digital Information Link network such that a seamless Coherent Tactical Picture is provided for command and control through all phases of a campaign. (Draft JICO Concept of Operations, Joint Theater Air and Missile Defense Organization, 19 June 1998).

Abstract

REEVALUATING DOCTRINE FOR
JOINT THEATER AIR AND MISSILE DEFENSE
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The Joint Theater Air and Missile Defense (JTAMD) threat is evolving rapidly. Such threats include not only Theater Ballistic Missiles, but also cruise missiles and eventually stealth attack aircraft. The US is developing new active defense systems to help meet the challenges of these threats. However, the joint doctrine, which is necessary to integrate these forces, is not keeping pace. Specifically, the doctrine must change in order to take advantage of the overlapping sensor and engagement envelopes that will become common once these advanced defenses are fielded.

This paper explores three proposals that will enable a JFC to better optimize and integrate a JTAMD network of sensors and weapons. First, the JFC should have the option of making the Area Air Defense Commander (AADC) a coequal with the Joint Force Air Component Commander. This option would improve interservice coordination and allocation of active defense units, especially during the deployment and lodgment phase of a campaign. Second, the Joint Information Control Officer (JICO) must be defined and empowered in order to overcome interservice interoperability problems and establish a theater-wide JTAMD picture. Third, in order to deconflict multiple engagements and maintain overlapping sensor coverage as the battle unfolds, the AADC may have to conduct both centralized planning and centralized execution.

Introduction

Although much has been written on the force structure and other such aspects of Theater Ballistic Missile Defense, one area of discussion that remains conspicuously absent is the role of Joint Doctrine. Specifically, does doctrine need to be reevaluated to ensure that the Joint Force Commander (JFC) can optimally arrange his forces to meet new Joint Theater Air and Missile Defense (JTAMD) challenges? That is, not only able to handle the threat of Theater Ballistic Missiles (TBMs), but cruise missiles and eventually stealthy attack aircraft as well. The current command and control structure defined in doctrine has remained unchanged for decades. The fundamental tenet of such a structure centers around decentralized execution with active defense forces and data links built on service specific requirements. Can such a stove-piped command and control structure meet the sophisticated challenges of tomorrow?

In this JTAMD problem, there are two variables that are changing, while one is remaining stagnant. The two changing ones are the rapidly evolving air defense threats mentioned above and the development of new US active defense forces that are being designed to counter some of these threats. However, joint doctrine is not keeping pace. After describing these variables, this paper will explore three proposed changes to doctrine that will better enable an operational commander to use these new defenses more effectively in countering such advanced threats. These three proposals are designed to help integrate these new active defense units into a cohesive and responsive network. First, should the JFC have several options to choose from in establishing his JTAMD command and control architecture instead of just one that is currently defined in Joint Doctrine? Key to this discussion on options is the role of the Area Air Defense Commander (AADC), ostensibly the commander in charge of JTAMD, and his relationship with the Joint Force Air Component Commander (JFACC). Second, there is little discussion in joint doctrine about the role of a new joint player, the Joint Interface Control Officer (JICO). It

appears that his role will be to establish the theater-wide data links vital to JTAMD. Where should he reside and how much authority should he have? The third proposal and most controversial of all, considers whether centralized command and decentralized execution continues to be the right commanding principal for JTAMD. A summarizing recommendation will then conclude this paper.

The First Variable: The Evolving Threat

The first changing variable is the evolving JTAMD threats. Primary among them is the proliferation of theater ballistic missiles. Appendix A lists selected countries possessing TBMs and their capabilities. In 1996, 21 Third World countries alone possessed ballistic missiles.[1] "While the threat posed by these systems is largely regional, the trend is clearly in the direction of systems of increasing range, lethality, accuracy and sophistication."[2] They are not only being acquired for the sake of deterrence, but for offensive purposes as well. Six of these 21 countries have already used them in armed conflict.[3] It is also difficult to predict how rapidly a country can advance its ballistic missile technology. For example, in July 1998, former Secretary of Defense Donald Rumsfeld and his nine-member Commission to Assess the Ballistic Missile Threat released their findings. The report stated that it would be at least 5 years before a realistic capability from one of these Third World Countries would threaten the US.[4] Within a month, two countries challenged that finding. Iran tested the Shahab-3 missile with a 1500 km range and the North Koreans tested their Taepo Dong-I missile with an estimated range of 5,000 to 7,000 km.[5] Such developments not only placed numerous countries and US forces at risk, but underscored how even the best intelligence estimates can be mistaken. Reacting to these series of events, Secretary of Defense Cohen made the stunning announcement on January 20, 1999 that the US was proposing to Russia the abandonment of the 1972 Anti-Ballistic Missile Treaty, which prevents either country from adequately

defending its population. Mr. Cohen said, "We are affirming that there is a threat, and that the threat is growing, and that we expect it will pose a danger not only to our troops overseas but also to Americans here at home."[6]

The threat of TBMs has also undergone a transition during the last eight years. First, during the Gulf War, the Iraqi Scud missiles were seen as being so inaccurate as to be militarily useless. Approximately 86 TBMs were launched at Israel and Saudi Arabia of which about 25 were intercepted by Patriot missiles.[7] Then on February 25, 1991, a Scud missile hit the US barracks at Dhahran airfield killing 28 US soldiers and wounding 99 others.[8] By the end of the war, Scud missiles accounted for 25% of US casualties.[9] The days of TBMs not being militarily useful had ended, but there were still some who attributed that strike to luck.[10] Following the Gulf War, United Nations inspectors in Iraq discovered an extensive Weapons of Mass Destruction (WMD) program, including a number of weaponized chemical and biological warfare agents which could have been delivered by a Scud missile.[11] This provided a new impetus for the US Theater Ballistic Missile Defense (TBMD) program – stopping WMD-tipped TBMs which could now threaten whole cities as well as critical US bases overseas. Accuracy, which was difficult for Third World countries to achieve, was no longer important, since such weapons require little precision. However, the political will to use them still seemed remote. Now in the late 1990's, the threat underwent yet another evolution. Mobile TBM launchers, in various threatening countries around the world, can now take advantage of GPS or GPS –like systems to help remove some of their targeting problems. Therefore, TBMs can now be part of a credible, conventional attack plan with WMD reassuming the role of deterrence. So, at the dawn of the 21st century, accurate, numerous and conventionally-tipped TBMs have ushered in a new era of challenges for the US.

The next most significant air defense threat for the US is cruise missiles. Anti-Ship Cruise Missiles (ASCM) are found in the inventories of over 70 countries today and are considered to be great equalizers.[12] The US Navy's air defense posture has largely been shaped by this threat (See Appendix B). Land Attack Cruise Missiles (LACM), in contrast, like the Navy's Tomahawk missile, are still rare throughout the world. Only a handful of countries have the technology to manufacture the more advanced LACMs. Yet, if one of these countries does not agree to abide by such non-proliferation treaties as the Missile Technology Control Regime then it appears to be only a matter of time before any of the so-called Rogue Nations (Iran, Iraq, Libya, Syria and North Korea) will have this capability.[13] China is one such country that has exported ballistic missiles to Pakistan and cruise missiles to Iran.[14] Recently the US Senate Committee on Foreign Relations convened a hearing on Chinese missile proliferation in which it tried to determine how such proliferation could be stopped.[15]

Conventional enemy attack aircraft have not been much of a threat for US forces in the past 20 years. However, like the proliferation of land-attack cruise missile technology, so too one can foresee a steady trickle of stealth technology seeping into the world's arms markets. In early January 1999, the Russians unveiled their new "stealth" fighter, the MiG-1.42.[16] Likewise, the French are in development of a "stealth" cruise missile, the APTGD.[17] Again, First World countries, like China, Russia or France, could arm potential enemies of the US with stealth aircraft technologies.

The Second Variable: Evolving US Defenses

The US has embarked on a significant program to upgrade and create new active defense systems for each of the Armed Services. Appendix C describes these systems in greater detail. Their underlying characteristics include the ability to defeat incoming JTAMD threats at greater range and altitude with a higher probability of kill. While most of these new systems

are being optimized for the TBM portion of the JTAMD family of threats, they may also be the only means of defending against LACMs and stealthy attack aircraft for some time to come.

Why Must Doctrine Evolve?

JTAMD doctrine today is designed for geographically separated active defense systems with independent, service-specific data links and command and control structures (See Appendix D). However, new US active defense sensor and weapon systems will more likely overlap than not (see Appendix E). This is not necessarily bad. In fact, in future JTAMD it is desirable. Sensor overlap is essential to overcome the cruise missile and eventually stealth aircraft threat, which are targets that are inherently difficult to detect. In this way targets get viewed from different angles and by different sensors. A target which is undetectable when viewed head-on by one sensor may become observable when viewed from a beam aspect or by a different sensor. "The key to a reliable anti-stealth detection system is an admittedly complex network of sensors...."[18] However, to achieve such an integrated JTAMD structure will require joint doctrine to be changed in three areas. Together, these three proposals will improve interservice coordination and asset allocation, allow each JTAMD unit to exchange vital information, and be responsive to a sophisticated threat.

Proposal I: Increasing Authority for the JTAMD Commander

1. Experiments in JTAMD Command Doctrine

As evidence that current JTAMD doctrine is not sufficient to meet the future threat, two combatant commanders have been experimenting with various new command and coordination echelons.[19] USEUCOM came up with a Theater Missile Defense Advisor (TMDA) and USCENTCOM is experimenting with a Theater Air Defense Commander (TADC). The CINCs were attempting to solve the planning and interservice coordination problems associated with just the TBM portion of the JTAMD threat. The TMDA essentially carves out

a specialized group from the JFC's staff to oversee all aspects of TMD, which includes not only the active defense coordination, but also passive defense and attack operations. Traditionally, the AADC has reported to the JFC through the JFACC (Fig. 1). This new staff is placed above the AADC and JFACC, but below the JFC. The other experiment, the TADC, adds this extra layer of coordination below the AADC with roughly the same functionality (Fig. 2).

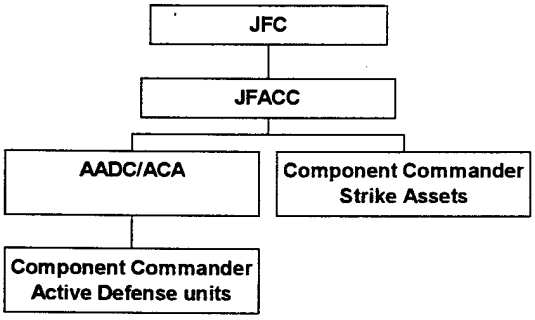

Fig. 1. Current Doctrinal Command Structure

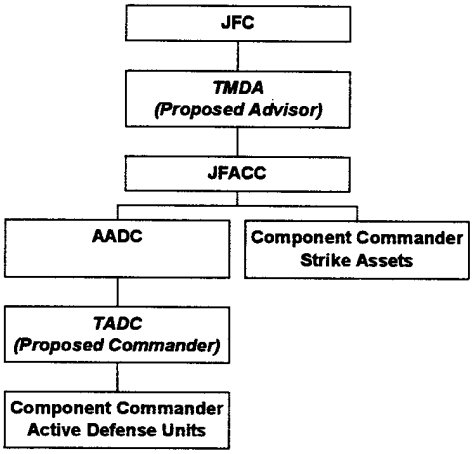

Fig. 2. Experimental Command Structures

Such efforts are commendable and illustrate the fact that there are serious interservice interoperability and doctrinal issues for ballistic missile defense. The problem with such efforts, though, is manyfold. First, the added layer of command and control adds complexity to an already time-compressed decision cycle which could be a serious impediment to success. This is because whenever a new command position is put into the decision loop the chances for confusion can be just as great as the hope for clarification that such an effort will bring. Second, in many scenarios, the AADC will likely come from out of theater in a reaction to a crisis. Thrusting this new *commander* (TADC) or *advisor* (TMDA) into an already

established, cohesive staff (AADC) at the beginning of a conflict could be disastrous since these new command echelons will not have had the benefit of training with the incoming AADC staff and developing key working relationships.

Most importantly, though, the mission of theater ballistic missile defense cannot be separated from that of overall JTAMD. A solution has to consider all three threats. That is, throughout the theater, common among each service, is the fact that it is the same sensors, weapon systems and operators who are executing all aspects of JTAMD. For example, a US Navy cruiser may be conducting a TBMD mission, but it is still performing defense against cruise missiles and enemy aircraft. A US Army Patriot battery is likewise defending an asset from all three threats. To add a command element that emphasizes defense of just one category of threats (TBMs) risks minimizing defenses for the other category of threats (cruise missiles and aircraft). Here the issue of asset allocation is not being properly adjudicated. It will be difficult to establish a balanced, integrated JTAMD structure in this command environment.

2. A Proposed Doctrinal Solution for Increasing JTAMD Command Authority

If these experiments are not the right solution then what is? The right solution for improving interservice coordination and allocation of active defense assets needs to come from a reevaluation of joint doctrine. The heart of this issue is the command relationships themselves between the JFC, the JFACC and the AADC. While the current command relationship has been tested successfully in the Gulf War, it may not always be the optimum arrangement in future, more sophisticated JTAMD conflicts. Today's doctrinally prescribed arrangement is optimized for a theater where the air strike capabilities of the enemy are unsophisticated, neutralized or non-existent. The JFACC has the maximum command over friendly strike assets and those assets allocated for defense. A benefit of such a command

relationship is that the JFACC can clearly define when active defense systems are to be used. For example, during the Gulf War there was concern that a friendly air defense unit would accidentally engage returning, but perhaps wayward, strike packages. Therefore, the JFACC severely restricted the ROE for active defense units.[20] This command relationship though, proved successful in the Gulf War.

However, what if the US was to face an enemy with a sophisticated strike capability? What if that enemy possessed land and sea-attack cruise missiles, ballistic missiles and aircraft that were difficult to detect? Some examples include the Korean Theater today or the European Theater during the Cold War. Perhaps the methods of the last war would not be the best. Restricting active defense units for fear of shooting down friendly aircraft may allow an unacceptable amount of enemy ordnance through. An overreliance on being able to destroy the enemy's strike capability early in the conflict may be unrealistic. For example, in the Gulf War the Coalition's record at destroying Scud Transportable Erector Launcher's (TEL) was almost completely unsuccessful, despite the vast amount of air and special operations resources thrown at the problem.[21] Furthermore, the US has yet to face the challenges of an enemy attack with LACM's while the track record with ASCM's is mixed.[22]

Faced with a robust enemy strike capability, what is the right doctrinal approach for the US? One possibility may be to give the AADC responsibility and authority to plan and then execute an Integrated Theater Air and Missile Defense. Making the AADC a coequal with the JFACC can provide this command authority. In this case, the AADC and the JFACC would report to the JFC separately (See Fig. 3). The benefit of such an arrangement is that the offensive aspects of US operations are not applied at the expense of the defensive aspects and thus suboptimizing JTAMD. In a situation where a Joint Force is responding to a crisis in an immature theater, the JFC may be more concerned with force protection issues during the

deployment and lodgment of limited forces in theater rather than concentrating on going on the offensive. Furthermore, it is increasingly likely that such defensive forces will be called upon to defend entire populations as well, which can transcend from an operational level to a strategic level requirement. In these cases, the JFC would like to ensure the AADC has all the assets necessary to provide an integrated defense against theater air and missile attacks. This process can be facilitated by making the AADC report directly to the JFC. Having to go through a JFACC may risk misinterpreting what is required and at least cause added complexity and delay where none is needed. If there are conflicting requirements, then the JFC can make the decision.

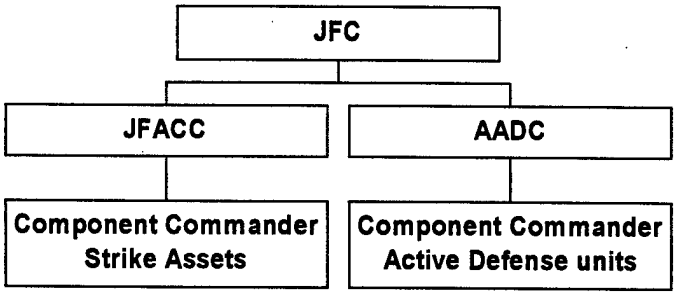

Fig. 3. Proposed Command Structure

A few examples of the conflicts between the JFACC and AADC over allocation of resources may help to illustrate why this option of making the AADC an equal partner has some merit:

- Faced against a TBM threat, the JFACC may want Aegis ships to be on call for Tomahawk or other fire support missions to destroy the launching sites. In contrast, the AADC may need to position these ships to protect valuable ports and cities in a defensive posture. These competing missions may be mutually exclusive.

- In response to an enemy aircraft threat, the JFACC may want to maximize aircraft going on strike missions to destroy enemy airfields. Meanwhile the AADC would want to station some of these aircraft close to valuable assets to enhance their defense.
- In a cruise missile threat environment, the AADC may want to position ships away from the littoral to allow for sufficient warning and response time. However, the JFACC may want to move a carrier as close to enemy territory as possible to maximize the striking range and operating tempo of his aircraft.

In these examples, if the AADC is subordinate to the JFACC, the JFC may never be aware of the critical force allocation decisions being made in support of his objectives.

One might reasonably conclude that if the defense is to be preferred over the offense during some phase in an operation, then why not also have the option to make the JFACC subordinate to the AADC? In this way the JFC could ensure that all available resources would be devoted to the defense without the delay of deconflicting resources at the JFC level. However, this command relationship may be too divisive. It is likely, that even in an early, defensive stage of a conflict, options will be drafted about conducting limited strike operations. So, there still needs to be a discussion worked out at the JFC level to weigh the balances of offense and defense. The AADC needs to be a coequal so that his requirements are clearly stated to the JFC, but the JFACC, likewise, needs to have that same unfiltered access to the JFC to determine the proper force allocations.

Therefore, joint doctrine should be changed to allow the JFC to consider two options in preparing the JTAMD command structure. The first option makes the AADC a coequal with the JFACC and the second option retains the current doctrinal relationship where the AADC reports to the JFC through the JFACC. One can envision scenarios where a JFC, having just arrived in an undeveloped theater, faces a sophisticated air threat. His priority at this stage is to

protect his few, early entry forces until he can build up sufficient forces to shift to an offensive footing. The pendulum of operations at this phase of the campaign is on the side of defense. The JFC may choose to have the AADC work directly for him until the theater is mature. Once sufficient forces are in theater, the pendulum of operations may now swing away from purely defensive operations to those of the offensive. At this transition point, the JFC could then change the command relationship by directing the AADC to report to him through the JFACC. Or, if the air defense threat is expected to continue while US forces conduct offensive operations, then the JFC may decide to leave the command relationship unchanged. Therefore, having joint doctrine offer these two options, listing their advantages and disadvantages allows the joint forces to better posture themselves in light of the situation.

An argument against defining these two options is that doctrine already allows the JFC to organize his staff and assign responsibility as he sees necessary. While this is true, without joint doctrine describing what his options are, he may never know that there are options with various implications to take into account. This is especially true if the JFC has little background in JTAMD or the threat is greater than U.S forces have ever faced before.

Proposal II: Interservice Interoperability –

A Proposal to Enhance JICO Responsibilities

Like experimental efforts to increase the command and control authority for JTAMD, so too there have been efforts at trying to optimize the network of sensors, communications and data links for JTAMD on a theater-wide scale. These efforts have focused on defining who is in charge of such efforts, how much authority should he have and where should he reside. This position is currently being called the Joint Interface Control Officer (JICO) which is poorly defined by Joint Doctrine.[23] USACOM has been sponsoring annual JTAMD exercises, called *Roving Sands* and *All Service Combat Identification Evaluation Team* (ASCIET), which have

been experimenting with JICO functions and responsibilities. Lessons learned from such exercises include the fact that the JICO did not have enough authority to direct data link architecture configuration changes or manage surveillance link operations.[24]

The JICO and his associated staff should be tasked with the responsibility of tying together all these disparate systems to establish a cohesive network. The JICO essentially would take the centralized planning done by the AADC and enable it with the appropriate information links. The purpose of such an effort would be to create a theater-wide "picture" of all friendly and enemy aircraft and missiles by fusing together each service's sensor data. Such a "picture" would enhance aircraft and missile detection, improve interservice coordination, and help to prevent fratricide. Clearly the JICO needs to reach across service boundaries to make it all work. When casualties occur or units move with the unexpected flow of battle, the JICO needs to rapidly establish alternate communication pathways.

Who should the JICO work for and where should he be positioned? The AADC has the most at stake. This network is critical to maintaining the situational awareness he needs in order to optimally perform JTAMD. The JICO therefore needs to be stationed with the AADC so that the two of them can plan and react together. If the JICO is on the JFC's staff, then that creates another layer of complexity and delay. Yes, the JFC is reliant upon maintaining communications as well, but his data link requirements are far less strenuous than they are for JTAMD. That is, JTAMD requires high volumes of data to be transmitted in near real-time between units, especially if the network is set-up to take advantage of different look angles and sensor frequencies. The JFC needs reliable communications, but low data rates. If the data link manager can maintain the large bandwidth pipelines, then the low data rate users are likely to be satisfied. This will probably not work in reverse. That is, if the JICO tries to maintain the minimum required for command and control, then the JTAMD data structure may suffer.

Another proposed JICO function is to give him the responsibility to assign each aircraft and missile, whether friendly or not, a single common nomenclature that each service can understand. Such a designation would provide the contact's position, identity, speed and heading. That is, what one service operator sees matches exactly what the other service operators see. Currently radar envelopes or tracking and reporting responsibilities are geographically separated mostly because the services' systems cannot talk the same JTAMD language.

An example of this suboptimization of JTAMD capabilities occurred during the Gulf War. The Navy was assigned tracking and engagement responsibility exclusively over water and the Air Force maintained it over land. Therefore, even though there were Navy cruisers stationed 35 nm from land with surveillance envelopes greater than 250 nm, and engagement envelopes greater than 80 nm, they were forbidden to report on or engage anything detected over land.[25] Similarly if the Air Force detects a JTAMD threat heading towards Navy ships, they had no way to pass that data, other than by voice, which is virtually useless for sophisticated threats. The problem with this dilemma is twofold: First, each service is prevented from gaining the benefit of multiple sensors and second, an enemy may someday take advantage of these interservice seams between JTAMD zones, like the artificial land-sea interface between Air Force and Navy, and use it as an avenue of attack.

Proposal III: A Case for Centralized Planning and Centralized Execution

One of the fundamental tenets found in the joint publications for JTAMD is the principal of centralized planning and decentralized execution.[26] For example:

> The AADC assists the JFC in determining missions, communications priorities and ROE for active defense forces based on assessment and prioritization of forces, critical assets, and population centers to protect. *Active defense forces are under the operational control of their component commanders,*

who employ these forces under the weapons control procedures and measures established by the AADC and approved by the JFC.[27]

For many reasons, this concept has been particularly attractive to US forces. First, it allows for individual initiative on the battlefield, by commanders who are most familiar with the situation, rather than from some central commander removed from the battle area who does not have the same situational awareness. Thorough training allows US commanders and forces to react decisively when confronted with unforeseen enemy actions rather than waiting for further direction from the rear. Such local, versatile command can help remove the problems associated with the fog of war and turn them to US advantage.

However, this command and execution principle may not be the optimum way to conduct JTAMD in the future. Such a proposal is controversial, but it is worth exploring in light of the evolving threat and increasing range of US active defense systems. Two examples may help to illustrate this point: deconflicting multiple engagements and controlling the movement of active defense units.

According to current doctrine, an active defense unit will engage a JTAMD threat once it meets engagement ROE. However, in the future, if there are two firing units with overlapping engagement envelopes, then according to current doctrine, both would engage the incoming threat. Like "little kid's soccer," everyone would rush for the ball. Such decentralized execution engagement policy would at least ensure that the target was engaged. However, an AADC may be concerned about husbanding scarce defense assets, as is likely to be the case in the foreseeable future. Such redundant expenditure then would be wasteful. Furthermore, a smart enemy would be able to estimate how many of these silver bullets we had in theater, and could set up a Course of Action which would force the US to expend these critical TMD assets with the minimum expenditure of his strike assets. Then, once the US inventory was nearly

depleted, he could attack his intended targets and decisively influence the course of the conflict.

A solution may be centralized execution. Here, an *executing* AADC could monitor the series of engagements that were being consummated and if two separate firing units were about to engage the same target, he could designate one particular unit as the primary engaging unit. He could base this decision on the relative interceptor inventories per unit, which unit had the highest probability of kill, or if one unit was taking the brunt of an attack the AADC could share the active defense burden with other units. Or conversely, in a WMD attack, he could direct every available unit to attempt the engagement. Such direction from higher authority may be necessary if there is a small probability of kill, if there is danger of engaging friendly forces or if there are few interceptors left.

The second example for centralized execution authority is the need to be able to react rapidly to changes on the battlefield. Some examples include changes in Enemy Courses of Action (ECOA), Own Courses of Action (OCA) or casualties that occur to active defense units. Underlining this theme of unexpected change is that there is no good way for the central planning authority (AADC) to adjust his JTAMD plan as the battle unfolds. For example, an air defense umbrella may need to be shifted to follow US forces that want to exploit success on the battlefield. Such movement of active defense units may have an impact on maintaining overlapping sensor coverage, that only a centralized authority can weigh the risks of on a theater-wide scale. Lacking flexibility in defense can take away flexibility in offense.

Centralized execution, in doctrinal terms, means placing active defense units under Operational Control (OPCON) or Tactical Control (TACON) to the AADC. JFCs have been hesitant to do this because a centralized execution authority lacks the situational awareness possessed by the local commander. However, for JTAMD, situational awareness means

something much different than the US military currently understands. Soon the extreme ranges and speeds of the JTAMD threats will force the US to look at the battle space as a whole, rather than a collection of disconnected entities. What is going on within the sensor range of that local commander, whether in a ship or at a Patriot battery, is not enough to thoroughly perform the mission of JTAMD. It requires a commander, who has a near real-time "picture" of the whole theater. This picture must include sensor data, intelligence, unit status and engagement results.

Therefore, if a component or local commander decides to take some action that changes the status of his sensor, such as moving it or turning it off, such action could affect the defenses elsewhere in the theater. In summary, the local commander or component commander may not have either the tools to make that decision or the necessary authority. The AADC may have the tools to make such decisions, but lacks the authority. The JFC may have the tools and authority to make these decisions, but probably will lack the time if he is busy with other, more pressing aspects of an unfolding operation. The AADC has the tools, understands the commander's intent for defense (Defended Asset List (DAL)), but lacks the joint doctrine authority to conduct centralized execution.

An argument that can be offered against centralized execution for JTAMD is summarized in *Command and Control for Joint Air Operations* (JP 3-56.1), which says, "Decentralized execution is essential to generate the tempo of operations required and to cope with the uncertainty, disorder, and fluidity of combat."[28] The theme of this argument for decentralized execution is that, in war, the best laid plans for how leaders are going to communicate and control their forces may be disrupted for a wide variety of reasons. The same could happen to an all-seeing and controlling AADC. Perhaps then there needs to be some middleground, which can utilize the inherent advantages that a centrally executing AADC provides, and to account

for disruptions that could happen in combat between this central authority and the outlying active defense forces. One solution is a principle called *command by negation.* Here, the active defense forces proceed with their engagements according to predetermined doctrinal procedures and ROE. The AADC meanwhile watches the battle unfold and only intervenes if there are compelling reasons to do so. As discussed earlier, such reasons include deconflicting multiple engagements of the same target, changes in Enemy or Own Courses of Action, or casualties to various units. Then, if communications are disrupted or the AADC loses its ability to see theater-wide, the active defense forces will still function according to their prescribed doctrine and inherent decision making ability. At that point, the defense will not be optimized, but at least it remains functional.

The US Navy conducted an exercise in May 1998, called Fleet Battle Experiment Charlie (FBE C), which explored some of these centralized execution ideas. Analysis was encouraging enough to indicate that such a change in doctrine merits further experimentation (See Appendix E).[29]

Conclusion

The JTAMD threat against US forces is becoming ever more sophisticated. The threat is real for it has already taken American lives. It is difficult to predict the rate at which this threat will grow, for in the past decade it has often seemed to catch the US off guard. Tremendous resources are being directed at solving the technological aspects of erecting a strong theater air and missile defense. These defenses will not only be used for force protection but to defend whole populations as well. One area that is vital to helping employ this defensive technology is the doctrine that defines how the US will integrate these forces. An analysis is necessary of the functions of future air and missile defense prior to enacting any change in Joint Doctrine.

Such a preliminary analysis was attempted in this paper which concluded that there are at least three ways in which JTAMD doctrine could be improved. First, empower the AADC by offering the JFC the option to make him a coequal with the JFACC. Such an option would improve interservice coordination and allocation of active defense assets. Second, define and empower the JICO in order to overcome interservice interoperability problems associated with establishing a theater-wide battle picture. Finally, the AADC may have to be able to conduct both centralized planning and centralized execution in order to react wisely and decisively in overcoming future JTAMD threats. Such operational control is necessary to maintain overlapping sensor coverage and optimize JTAMD unit engagements. If ever there was a reason for absolute jointness, it is in the joint solution of the JTAMD problem.

Appendix A: Selected World Ballistic Missile Programs[30]

Country	System	Type	Range (km)	Payload (kg)	Status
Afghanistan	SS-1 Scud-B	SRBM	300	1,000	In Service
Algeria	SS-1 Scud-B	SRBM	300	1,000	In Service?
Argentina	Alacran	SRBM	200	500	In Service
Brazil	MB/EE-150	SRBM	150	500	Terminated
	SS-300	SRBM	300	1,000	Terminated
	SS-600	SRBM	600	500	Terminated
China	CSS-2	MRBM	2,800	2,150	In Service
	CSS-3	IRBM	4,750	2,200	In Service
	CSS-4	ICBM	12,000	3,200	In Service
	CSS-N-3	SLBM	1,700	600	In Service
	CSS-6	SRBM	600	500	In Service
	CSS-7	SRBM	300	500	In Service
	DF-25	MRBM	1,700	2,000	In Development
	DF-31	ICBM/SLBM	8,000	700	In Development
	DF-41	ICBM	7,440	800	In Development
Egypt	SS-1 Scud-B	SRBM	300	1,000	In Service
	Scud derivative	SRBM	450	?	In Service?
	Vector-Condor II	SRBM	800-1,000	?	?
India	Prithvi-150	SRBM	150	1,000	In Service
	Prithvi-250	SRBM	250	500	Tested
	Prithvi-350	SRBM	350	?	In Development
	Agni	MRBM	1500-2500	1,000+	In Development
	Surya	ICBM	12,000	?	In Development?
Iran	M-11 variant	SRBM	300	500	In Development?
	Mushak-200	SRBM	200	?	In Development
	Nodong-1	SRBM	1,000	1,000	Delivery?
	SS-1 Scud-B	SRBM	300	1,000	In Service
	Scud-C	SRBM	500-700	500	In Service
	Tondar-68	SRBM	1,000	500	In Development
Iraq	Ababil-100	SRBM	130-140	300	In Development
	SAKR 200	SRBM	150	500	In Development
	Al Hussein	SRBM	600	500	Some Remain
Israel	Jericho I	SRBM	480	500	In Service

	Jericho II Jericho III	MRBM MRBM	1,450 2,800	1,000 1,000	In Service In Development?
North Korea	Scud-B variant Scud-C Nodong-1 Taepo Dong-1 Taepo Dong-2	SRBM SRBM SRBM MRBM IRBM	300 500 1,000 1500-2000 4000-6000	1,000 500 1,000 1,000 ?	In Service In Service In Production? In Development In Development
South Korea	NHK-1 NHK-A	SRBM SRBM	250 300	300 300	In Service In Development
Libya	SS-1 Scud-B Al-Fatah	SRBM MRBM	300 ?	1,000 ?	In Service In Development
Pakistan	Hatf-2 Hatf-3 M-11	SRBM SRBM SRBM	280 600 300	500 500 500	In Development In Development? In Service?
Saudi Arabia	CSS-2	MRBM	2,650	2,150	In Service
South Africa	Arniston	MRBM	1,450	1,000	Terminated
Syria	SS-21 SS-1 Scud-B Scud-C	SRBM SRBM SRBM	70 300 500	482 1,000 500	In Service In Service In Service
Taiwan	Ching Feng Sky Halberd? Tien Ma	SRBM SRBM SRBM	130 300 950	400 ? 500	In Service In Development In Development
UAE	SS-1 Scud-B	SRBM	300	1,000	?
Vietnam	SS-1 Scud-B	SRBM	300	1,000	In Service
Yemen	SS-21 SS-1 Scud-B	SRBM SRBM	70 300	482 1,000	In Service In Service

SRBM – Short-Range Ballistic Missile (up to 1,000 km range)
MRBM – Medium-Range Ballistic Missile (1,000-3,000 km range)
IRBM – Intermediate-Range Ballistic Missile (3,000-5,500 km range)
ICBM – Intercontinental Ballistic Missile (range greater than 5,500 km)

Appendix B: The US Navy's Defense in Depth Concept

The US Navy has believed in defense in depth as an air defense concept for as long as there has been a cruise missile threat. Something that the other services, fortunately, have not yet had to contend with. Air Defense planners for the Navy have found that defense-in-depth, with overlapping coverage is not only feasible, but also often desirable. No one system can handle every threat. Further, by bringing to bear multiple weapon and sensor systems one can improve the probability of kill. That is, in a large, coordinated air defense raid, the incoming missiles (or aircraft) have to pass through a succession of defenses, each one possibly different than the one before.

Appendix C. US Active Defense Systems in Development[31]

	Land	Sea	Air
Upper Tier	Theater High Altitude Area Defense (THAAD)	Navy Theater Wide	Boost Phase Intercept – Airborne Laser
Lower Tier	Patriot PAC-3	Navy Area	

PATRIOT Advanced Capability-3 (PAC-3): PAC-3 is a lower-tier, endoatmospheric TMD system that builds on the existing Patriot air and missile defense infrastructure. It is an area defense system which has been modified twice since the Gulf War.

Navy Area Defense System: This program builds upon the existing Aegis/Standard missile infrastructure. It also is an endoatmospheric system. It can provide air and missile protection for nearby land based assets early in a conflict due to the routine naval deployments worldwide.

Theater High Altitude Area Defense (THAAD): This upper-tier system allows intercepts of longer-range TBMs at high altitudes and further downrange than area defenses. It is both an endo- and exoatmospheric system.

Navy Theater Wide (NTW): This system also builds upon the Aegis and Standard missile program. However, this upper-tier system will modify the standard missile for ascent, midcourse and descent phase exoatmospheric intercepts.

Airborne Laser: This program is designed to destroy TBM's in the boost phase of their flight. An advantage of this program is that it would cause such missiles and their warheads to fall on enemy territory.

Appendix D. Notional Current Engagement Envelopes

Appendix E. Notional Future Engagement Envelopes

Appendix F. Fleet Battle Experiment Charlie – Recommendations[32]

- Risk assessment must consider impact of weapons expenditure and asset management.
- Need for tools to analyze sensor coverage, weapons inventory, C4I architecture for JTAMD.
- Experimentation should continue to assess how to better employ distributed collaborative planning…should better understand issues of network control and robustness, bandwidth management.
- AADC…facilitates evaluation of mission, COA, ECOA; wargames COAs and provides statistical analysis of risk to the commanders DAL.
- The AADC three-dimensional display improves the watch officer's ability to understand the battlespace.

Notes

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[12] Carus, 14-15.

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[15] Ibid., 1.

[16] Sergio Coniglio, "Air-to-Air Combat in the "Stealth Era," *Military Technology*, May 1995, Vol. XIX, No. 5, 53.

[17] Jean-Paul Phillipe, "Matra to Develop APTGD Missile," *Military Technology*, February 1995, Vol. XIX, No. 2, 60.

[18] Coniglio, 56.

[19] Charles C. Swicker, Theater Ballistic Missile Defense From The Sea, The Newport Papers (Newport RI.: Naval War College Press, August 1998), 72.

[20] Director, Theater Air Warfare (N865), "Area Air Defense Commander White Paper," (Washington: 26 August 1997), 2.

[21] McMahon, 72. "The Coalition was forced to divert one-third of the more than two thousand air combat and support missions flying each day to the "Scud Hunt,"" 59.

[22] That is, since the *USS Stark* was hit over 10 years ago by two Exocet missiles, a US Navy ship hasn't been hit since, despite coming under attack during Operations *Praying Mantis* and *Desert Storm*.

[23] Roving Sands 97 Lessons Learned, "Joint Interface Control Officer (JICO) Defined Duties and Responsibilities," Director, Air Force Center for Lessons Learned, Obtained from Naval War College on-line Library, 22 May 1997.

[24] Roving Sands 97 Lessons Learned, "Joint Interface Control Officer (JICO)," Director, Air Force Center for Lessons Learned, Obtained from Naval War College on-line Library, 22 May 1997.

[25] N865 White Paper, 2.

[26] The primary doctrine for JTAMD is found in JP 3-01.5, *Doctrine for Joint Theater Missile Defense* and JP 3-56.1, *Command and Control for Joint Air Operations.*

[27] "Doctrine for Joint Theater Missile Defense," x-xi.

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